IMAGE TRACKING ENDOSCOPE SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to an endoscope system in which an endoscope is inserted in part into a body cavity of a patient so as to enable a surgeon to observe an image of the interior of the body cavity.

2. Description of the Related Art

Recently so-called endoscope surgery has been put to practice. To perform endoscope surgery, a medical instrument and the insertion section of an endoscope are inserted, in part, into a patient's body cavity. The endoscope provides an image of the inserted part of the instrument and an affected tissue present in the body cavity. Observing the images of the instrument and the tissue, a surgeon manipulates the medical instrument, thereby treating the affected tissue. Endoscopic surgery is less invasive to the patient than surgery which begins with laparotomy or thoracotomy by using a knife. This is why endoscope surgery is now practiced frequently. In particular, laparoscope surgery using a laparoscope is performed often.

In endoscope surgery, the surgeon inserts the distal section of a medical instrument and the insertion section of the endoscope into the body cavity. A surgeon's assistant holds the endoscope. The endoscope provides the images of the medical instrument and affected tissue, both present in the body cavity. The images are displayed on a TV monitor. Seeing the images displayed, the surgeon manipulates the medical instrument, treating the affected tissue in the body cavity by, for example, cutting and extracting the affected tissue from the body cavity.

Whenever necessary, the surgeon may instruct the assistant to move the endoscope in a desired direction, so as to have the images of the instrument and affected tissue displayed at different positions on the TV monitor screen. Usually the surgeon wants the distal section of the instrument displayed in the center part of the monitor screen. In some cases he or she may need to have the distal section displayed at another position on the monitor screen.

For the assistant it is often difficult to move the endoscope in the specific direction the surgeon has designated. The assistant must be skillful to move the endoscope exactly in accordance with the surgeon's instructions. Further, it is very hard for the assistant to hold the endoscope for a long time until the endoscope surgery comes to an end. In most cases, other assistants need to participate, one after another.

Jpn. Pat. Appln. KOKAI Publication No. 5-337118 discloses a scope-holding device for holding an endoscope. The scope-holding device comprises an electrically driven manipulator and a motion-detecting unit. The manipulator is designed to hold and move an endoscope. The motion-detecting unit is devised to detect the distance and direction in which a medical instrument has been moved. During endoscope surgery, the manipulator holding an endoscope is moved for the distance and in the direction, which the motion-detecting unit has detected. The endoscope is therefore moved in the same way as the surgeon has moved the medical instrument. As a result, the image provided by the endoscope and displayed on a TV monitor is automatically switched as the surgeon moves the medical instrument.

PCT International Publication No. W094/3113 discloses a scope-holding device of another type. This device comprises a drive unit and an input unit. The drive unit is designed to hold and move a surgery device such as an endoscope. The input unit has a foot switch or the like. When controlled by a signal output from the input unit, the drive unit moves the endoscope to a desired position so that the endoscope may provide an image of an object present at that position.

The scope-holding devices described above are disadvantageous in two respects. First, they are large and expensive, inevitably because they comprise a drive unit (e.g., an electrically driven manipulator) for moving an endoscope and a control unit for controlling the drive unit. Second, it takes much time to set an endoscope on the drive unit, and to connect the control unit to the drive unit.

SUMMARY OF THE INVENTION

In view of the foregoing, the present invention has been made. Its object is to provide an endoscope system which is compact, inexpensive and easy to set up.

According to the invention, there is provided an endoscope comprising: an endoscope; endoscope-holding means holding the endoscope; image pickup means having an optical system for receiving an endoscopic image from the endoscope; position-detecting means for detecting a position of an object observed trough the endoscope and for generating position data representing the position detected; display means for displaying the endoscopic image provided by the image pickup means; and view field switching means for switching a view field of the endoscope without moving the endoscope, in accordance with the position data.

The image of the object of interest can therefore be displayed at the same position on the screen of the display means even when the object moves in the body cavity. Further, the image of any other object located near the object of interest in the body cavity can be displayed at a designated position on the screen of the display means.

Additional objects and advantages of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and obtained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings, which are incorporated in and constitute a part of the specification, illustrate presently preferred embodiments of the invention and, together with the general description given above and the detailed description of the preferred embodiments given below, serve to explain the principles of the invention.

FIG. **1** is a perspective view showing an endoscope surgery system according to a first embodiment of the present invention;

FIG. **2**A is a diagram explaining how an image represented by a part of the image data stored in the image memory embodiment is displayed in a specified region of a TV monitor screen, in the endoscope surgery system shown in FIG. **1**;

FIG. **2**B is a diagram explaining how an image represented by another part of the image data is displayed at the same position on the TV monitor screen as the image represented by the first-mentioned part of the image data;

FIG. **3** is a block diagram of the control section incorporated in the endoscope surgery system shown in FIG. **1**;

FIG. **4** is a perspective view showing an endoscope surgery system which is a second embodiment of this invention;